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*Published in:*  
OBM Integrative and Complementary Medicine

*DOI:*  
[10.21926/obm.icm.1904065](https://doi.org/10.21926/obm.icm.1904065)

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*Recommended citation(APA):*  
Stapleton, P. B., Trude, R., Mackintosh, G., Sparenburg, E., Sabot, D., & Carter, B. (2019). Online Delivery of Emotional Freedom Techniques in the Treatment of Food Cravings and Weight Management: A Randomised Controlled Trial. *OBM Integrative and Complementary Medicine*, 4(4). <https://doi.org/10.21926/obm.icm.1904065>

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Original Research

## Online Delivery of Emotional Freedom Techniques in the Treatment of Food Cravings and Weight Management: A Randomised Controlled Trial

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OBM Integrative and Complementary Medicine  
2019, volume 4, issue 4  
doi:10.21926/obm.icm.1904065

**Received:** October 14, 2019  
**Accepted:** December 09, 2019  
**Published:** December 17, 2019

### Abstract

**Background:** The combination of dietary restraint and physical exercise as a recommended treatment for weight loss has had limited long-term success. One factor proposed as limiting weight management techniques efficacy is the failure to target psychological processes linked with overeating. Consistent with prior research that has identified the efficacy of emotional freedom techniques (EFT) in reducing food cravings and aiding weight loss, this pilot randomised controlled trial (RCT) examined the impact of online delivery of EFT intervention on food cravings and weight management.

**Methods:** Participants were randomly assigned to an eight-week online EFT intervention group or waitlist control group. The sample comprised primarily of women (96%) aged between 41 and 60 years. Of the treatment group, 65% consumed their craved foods daily and had an average Body Mass Index in the obese range (33.3). Outcome measures assessed included food cravings, dietary restraint, subjective power of food, weight, somatic (body sensation), anxiety, and depressive symptoms.



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**Results:** Post-intervention analyses revealed significant reductions on all measures for participants in the EFT condition ( $n = 314$ ) with Cohen's effect size values suggesting moderate to high practical significance for the online intervention. However, there were no significant differences for participants in the waitlist control group ( $n = 137$ ). In this crossover study design, post-test waitlist data was then collapsed into the EFT treatment group data for follow-up analyses, which indicated treatment gains on all measures at 6-month ( $n = 216$ ) and 12-month ( $n = 145$ ) follow-up.

**Conclusions:** Findings constitute preliminary support for the utility of online EFT as an accessible tool to assist the management of food cravings and body weight.

### Keywords

food cravings; anxiety; online therapy; emotional freedom techniques; tapping; weight; obesity

## 1. Introduction

By the year 2030, it is anticipated the global obesity epidemic will directly affect 57.8% of the world's population [1]. It is well established that being overweight (body mass index; BMI;  $\geq 25$ ) or obese (BMI  $\geq 30$ ) increases the risk of developing chronic health conditions including type 2 diabetes mellitus, coronary heart disease, and cancer [2]. The aetiology of excessive weight has largely been attributed to the expanse of westernised lifestyle, which promotes overconsumption of energy-dense foods and sedentary behaviour [3,4]. Existing weight-loss interventions have sought to address excess body weight via a combination of dietary restraint and physical exercise [5,6]. However, such traditional treatment strategies, which disregard the biopsychosocial complexity of behaviours that influence dysfunctional eating, have proven largely ineffective for long-term weight-loss maintenance [7,8].

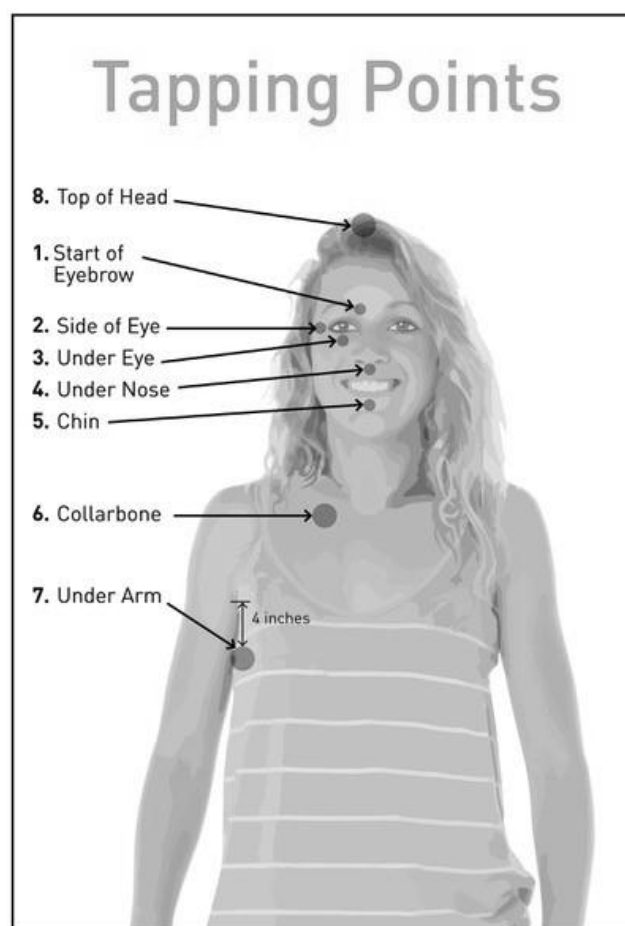
Research on weight and psychiatric comorbidity suggests that obese individuals are two to four times more likely to experience depression and anxiety disorders [9,10]. Psychological constructs such as food craving (an intense physiological and emotional urge or desire to consume particular food [11]) and restrained eating (conscious effort to restrict food intake for the purposes of weight control that can lead to disinhibition of eating behaviours [12]) have been linked to food overconsumption, weight gain, and unsuccessful long-term weight loss [13-16]. Since mood disorders and anxiety disorders are associated with higher drop-out rates from therapy interventions and poor treatment response (e.g., [17]), and depression levels are often a predictor of weight regain after dieting, it is imperative to design weight-loss interventions that also target these commonly experienced psychological difficulties. Furthermore, other research indicates complete weight re-gain typically occurs within three years following behavioural weight reduction programmes [18], and this may relate to the increases in food craving frequency that can occur through dieting attempts. Therefore, successful management of food cravings may provide a key to weight loss [14,19].

A review of the literature indicates that weight-loss treatments are often limited by their expense and the effort required to adhere to lengthy treatment regimens [8]. Strategies that

adequately address the interconnected psychological and physiological mechanisms associated with overeating are required, including those based in the field of energy psychology [8]. Novel and distinctive craving reduction strategies could serve as vital therapeutic tools in reducing the impact of obesity [20].

### **1.1 Emotional Freedom Techniques**

Emotional Freedom Techniques (EFT) is a therapeutic method stemming from energy psychology. Energy psychology is a mind-body approach that typically focuses on the relationship between bioenergy systems, neuro and electro physiological processes, and mental functions involving thoughts, emotions, sensations, and behaviour. EFT combines elements of established psychotherapeutic techniques, such as exposure and cognitive therapy, with the somatic stimulation of acupressure points [21]. Energy psychology approaches include interventions such as thought field therapy (TFT) and eye movement desensitization and reprocessing (EMDR) therapy. Practitioners and clients follow a manualised form of EFT practice referred to as Clinical EFT [22]. Clients tap on a series of eight acupressure points on the body with their fingertips while focusing on a trigger (e.g., problem, distressing memory, event, emotion). The imaginal exposure is accompanied by a setup statement that reframes the trigger into words of self-acceptance. For example, in an EFT session an individual might state, “Even though I have this issue (insert trigger), I completely accept myself.” The individual typically states the setup statement three times while tapping on the side of the hand point. The tapping sequence is then initiated and each acupoint is tapped approximately seven times, while the individual repeats a reminder phrase, which facilitates exposure to the memory. For example, “I feel stressed” is a shortened version of “Even though I feel stressed, I completely accept myself”. Before and after each application of EFT, the client rates the intensity of their subjective units of distress (SUDS [23]) on a scale of 0 to 10, and the process is repeated until the client reports a discomfort rating of zero [22]. Figure 1 identifies the eight tapping points used during treatment.



**Figure 1** Eight tapping points utilised in EFT practice. Copyright 2018 by Peta Stapleton. Reprinted with permission.

Neuroimaging studies measuring the effects of acupuncture stimulation on fear responses have supported the use of acupressure point stimulation to reinforce the cognitive and exposure components in EFT. In functional magnetic resonance imaging (fMRI) studies, acupuncture stimulation has been found to down-regulate hyperarousal of the amygdala, thereby regulating the stress response, which in turn has been found to slow the heart rate, decrease anxiety, and induce calm [24-26]. Studies on somatic stimulation of acupressure points without the use of needles have found ‘tapping’ to be as effective as acupuncture needling [see 27]. One review concluded that tapping on acupressure points during imaginal exposure “quickly and permanently reduces maladaptive fear responses to traumatic memories and related cues” ([28] p. 385). Additionally, empirical support has been found for EFT treatment and associated improvements in a range of physiological indicators of health such as heart rate variability (HRV), blood pressure, and cortisol levels [29-32] and regulation of inflammation and immunity genes [33,34].

EFT has been subjected to a systematic review which concluded that the approach meets the criteria detailed by the American Psychological Association’s Division 12 Task Force on Empirically Validated Treatments for a number of psychological conditions [35], including depression [35,36] anxiety [37], post-traumatic stress disorder [35], and phobias [38, 39]. Other meta-analyses support the efficacy of EFT in the treatment of anxiety, depression, and posttraumatic stress

disorder (PTSD) [40-42]. Collectively, the research adds to the growing evidence base for EFT as an effective mental health intervention.

## **1.2 Evidence for Food Cravings**

Several empirical studies have examined the impact of EFT on weight loss, weight maintenance, cravings, and food addiction. Church and Brooks [37] examined the effects of a one-day EFT workshop on psychological distress symptoms (e.g., anxiety and depression), pain, and food cravings among 216 healthcare workers (e.g., psychotherapists, physicians, nurses, and chiropractors). Participants had significant reductions across all areas of psychological distress symptoms (e.g., depression, anxiety, somatisation) at post-test, and treatment gains were maintained at the three-month follow-up. Significant reductions in pain (-68%), severity (-45%), and breadth (-40%) of psychological symptoms, and habitual cravings for food substances (-83%) also occurred. Stapleton, Sheldon, Porter, and Whitty [43] conducted an RCT (treatment group,  $n = 49$ ; waitlist control,  $n = 47$ ) which examined the efficacy of an EFT group program, comprised of weekly two-hour sessions over four weeks, for overweight and obese adults. Significant differences between pre, post, and 12-month follow-up were found in participants' weight, food cravings, the subjective power of food, craving restraint, and depressive symptoms. Although the study did not have an active control group, results suggested that EFT aided the successful management of food cravings. Additionally, in an RCT that extended Stapleton et al.'s [43] trial, Stapleton, Bannatyne, Porter, Urzi, & Sheldon [44] examined food cravings in overweight and obese adults, comparing an eight-week EFT in-person treatment group program ( $n = 51$ ) with CBT ( $n = 36$ ) and no intervention ( $n = 92$ ). EFT and CBT were found to be equally efficacious in reducing subjective power of food, dietary restraint, and depressive symptoms from pre-to post-treatment, with improvements maintained at six and 12-month follow-ups. Participants in the EFT group also demonstrated significantly greater reductions in food cravings and symptoms of anxiety than participants in the CBT group, with scores maintained at six and 12-month follow-up.

The clinical utility of EFT to address the influence of food in the external environment and assist weight loss was recently examined in 76 participants enrolled in a six-week online EFT course [45]. Weight, restraint, the power of food in the external environment (e.g. the psychological impact of environments in which highly appetising foods are readily available), happiness, and PTSD symptoms were assessed before and after the course and at one-year follow-up. Statistically significant improvements were found in body weight, depression symptoms, restrained eating, and subjective power of food measures. Weight decreased an average of 1 pound per week during the course and 2 pounds per month between pre-test and one-year follow-up. Church et al.'s [45] results indicate that EFT may promote beneficial long-term change when delivered in an online format. Research has also highlighted the neurological mechanisms that underlie successful weight loss through EFT. A pilot RCT investigated the effect of EFT on brain activation in response to food craving using fMRI [46]. Fifteen overweight or obese adults were allocated to a four-week group EFT treatment or control condition. Random repeating images of high-calorie food designed to engage parts of the brain were presented during the pre-test and post-test fMRI scans. Food craving mean scores decreased by 18% for the EFT treatment group compared with 5% for the control group. Brain activity mapping suggested relative deactivation in the Superior Temporal Gyrus and lateral orbitofrontal cortex for the EFT treatment group only. Such findings offer

support to the premise that EFT can direct signals that influence neural activity in specific ways [47].

### **1.3 Online Programs**

Internet-based therapeutic interventions, known as e-Interventions, have been used to assist a range of health promotion strategies for at-risk populations, specifically in the provision of evidence-based psychological interventions for the treatment of mental disorders [48]. Numerous feasibility and evaluation studies have evaluated the efficacy of e-Interventions [49-51]. A comprehensive meta-analysis found significant reductions in targeted symptomatology, with effect sizes comparable to the average effect sizes found in conventional in-person therapy [52]. As standard face-to-face interventions require in-person attendance for participants, e-Interventions hold more promise for increasing public access to evidence-based psychological interventions, especially to populations where previous access has been poor [48,53]. These populations include individuals in rural and remote areas as well as individuals in prison, or those with severe social anxiety or claustrophobia [48].

In a qualitative review of the determinants that influence individuals' health (e.g., social support, physical environment, access to health services), the delivery of EFT intervention via online and telehealth mediums was examined in chronic disease patients [54]. Self-administration of EFT online and via telephone delivery was found to offer a useful alternative for residents of remote and rural areas without access to mental health services. EFT was also considered beneficial in groups using online videoconferencing platforms to provide a social support network. In a quantitative examination, the effects of self-administered EFT delivered via the Internet on perceptions of pain, acceptance and coping ability, and health-related quality of life (HRQOL) was examined in 62 women with fibromyalgia [55]. Participants were randomly allocated to an eight-week online EFT treatment group or waitlist control group. Following a waiting period, participants in the waitlist control group received EFT treatment. Results revealed statistically significant reductions in pain catastrophizing (e.g., rumination, magnification), improved activity levels, decreases in symptoms of anxiety and depression, and improvements in HRQOL measures in the EFT group compared to the waitlist control.

Another study examined the effects of a six-week online EFT program on a range of affective and craving symptomatology [56]. Overweight or obese adults who were self-selected to the program (n = 72) received weekly reading materials, tapping scripts, and live coaching covering specific topics related to emotional eating, and were also members of a private Facebook group for support. Results revealed significant weight reductions during the six weeks (approximately 5.4 kg or 11.9 lb), with treatment effects maintained at six-month follow-up and enhanced through a further 1.3 kg of weight loss (2.86 lb). Despite some study limitations (i.e., no active comparison group), results suggested the online administration of EFT assisted the management of food cravings and weight reduction.

### **1.4 The Present Study**

The efficacy of e-Interventions in the provision of therapy and increased public access to evidence-based treatments have been detailed in the literature [48-51]. However, support for EFT as an e-intervention for effective health promotion is currently limited [55,56]. Given the

emerging body of research which has identified EFT treatment as an efficacious in-person treatment of weight and eating issues in overweight and obese adults, the current study aimed to assess the impact of an eight-week online EFT treatment program using outcome data collected at baseline, post-intervention, and at six- and 12-months follow-up. It was hypothesised that EFT intervention participants compared to the waitlist control would experience statistically significant reductions immediately post-intervention on seven outcome measures: weight, food cravings, dietary restraint, subjective power of food, depressive, anxious, and somatic symptomatology. Additionally, it was proposed that the gains observed in post-intervention outcome measures would be maintained at six-months and 12-months.

## **2. Materials and Methods**

The trial was registered with the Australian New Zealand Clinical Trial Registry (ANZCTR) following ethical approval from Bond University's Human Research Ethics Committee (Application RO15270; approved 14 July 2015).

The current parallel-group RCT with imbalanced randomisation [3:1] was conducted from August 2015 to June 2017. The trial was registered with the Australian New Zealand Clinical Trial Registry (ANZCTR) following ethical approval from the university's Human Research Ethics Committee.

### **2.1 Recruitment**

A purposive sample was recruited via community announcements in print advertisement, radio, and television. No incentive for participation was offered. Study inclusion criteria included: minimum 18 years of age, overweight or obese (as measured by self-reported BMI), experience of regular food cravings or emotional eating as measured by the Food Craving Inventory as a screening tool, no severe psychological impairment (assessed online using the SA-45 [57]) no current treatment for psychological or medical issues related to food cravings, or engagement in a weight loss program for the trial duration. Both males and females were eligible to participate. Exclusion criteria included: current and history of bulimia nervosa or anorexia nervosa as self-disclosed by participants as the researchers were not able to provide individual support for these disorders, a BMI < 18, pregnancy, and individuals with diabetes mellitus (type 1 or 2) and hypoglycaemia. Although participants may have been included in the study who met binge eating disorder criteria or subclinical eating problems, these were not measured.

Unsuitable or superfluous participants were advised via letter that they did not meet selection criteria or limited funding prevented their selection.

Participants accessed an online questionnaire that displayed an explanatory statement, which stated that participation in the voluntary study required follow-up measurements and informed consent. Participants provided demographic information (e.g., age, sex, height, weight, highest education level), identified the type of foods craved (e.g., chocolate, salty foods, sweet carbohydrate foods), and the frequency of food cravings and consumption of craved foods. The pre-trial self-report questionnaire package consisted of four empirically-established measures (detailed below). Participants received requests for post-test questionnaire completion at six and 12-months via email. If no response was received after three email communication attempts, follow-up was aborted.



## 2.1.1 Participants

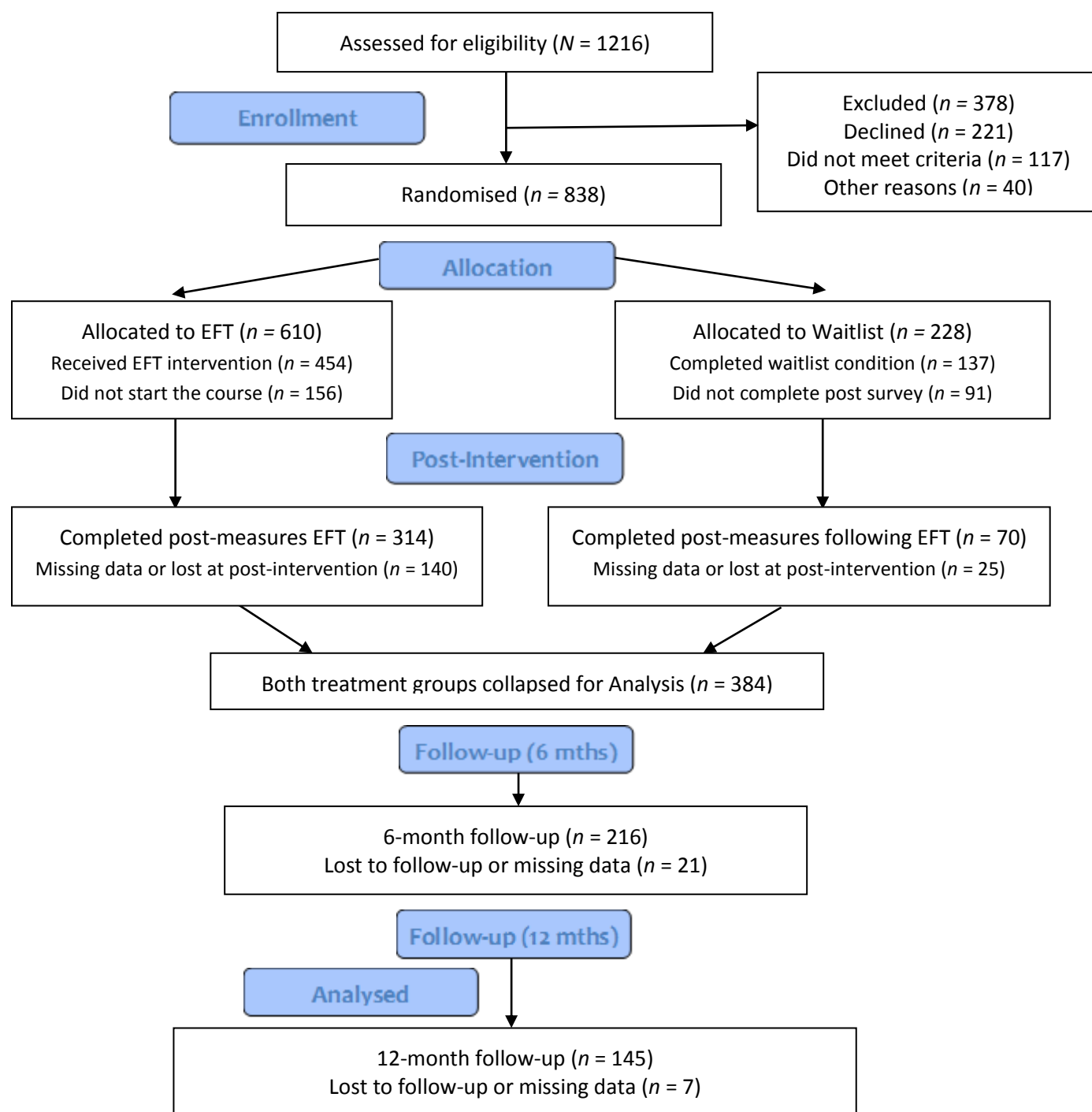
A priori power analyses were conducted using G\*Power, version 3.1 [58]. The sample size required to estimate a medium effect for the two-way mixed-methods analysis of variance (ANOVA) was 158 participants ( $\alpha = .05$ ,  $\beta = .05$ ). The current sample satisfied this. Additionally, with power also set at .95, the sample size required to estimate a medium effect for the repeated measures design was 36 participants per group. Therefore, the collapsed sample size had sufficient power [59,60]. Demographic information for the EFT group ( $n = 314$ ) and the waitlist control group ( $n = 137$ ) are displayed in Table 1.

**Table 1** Summary of demographic information.

<i>Variable</i>	EFT Group ( $n = 314$ )	Waitlist Group ( $n = 137$ )
Gender		
Female	302 (96%)	129 (94%)
Male	12 (4%)	8 (6%)
Age		
≤ 25 years	3 (1%)	2 (2%)
26 to 30 years	4 (1%)	5 (4%)
31 to 40 years	37 (12%)	16 (12%)
41 to 50 years	92 (30%)	41 (30%)
51 to 60 years	103 (34%)	53 (39%)
≥ 61 years	68 (22%)	18 (13%)
Mean BMI ( <i>SD</i> )	33.3 (6.52)	34.31 (5.95)
Normal weight	21 (7%)	5 (8.7%)
Overweight	91 (30%)	33 (25%)
Class I BMI 30 – 34.99	91 (30%)	38 (28%)
Class II BMI 35 – 39.99	52 (17%)	28 (21%)
Class III BMI 40+	50 (16%)	30 (24%)
Married	166 (54%)	78 (58%)
Education post-secondary school	266 (86%)	112 (84%)
Employed	234 (75%)	106 (77%)
Income (AUD\$)		
< \$10,000	4 (1%)	3 (2%)
\$10,001 to \$40,000	60 (20%)	33 (25%)
\$40,001 to \$60,000	62 (21%)	20 (15%)
\$60,001 to \$80,000	44 (15%)	21 (16%)
\$80,001 to \$100,000	52 (17%)	21 (16%)
> \$100,000	82 (27%)	37 (27%)

A total of 962 potential participants worldwide registered their interest to participate in response to the community announcements. Participants were randomly assigned to an EFT treatment group or waitlist control group via computerized random-number generator system that was administered by a statistician who was blind to the study aims (see Figure 2 for CONSORT diagram). Of the EFT treatment group, 352 individuals did not complete the initial survey questionnaires and were excluded from the study (including 117 who did not meet inclusion criteria). One hundred and fifty-six participants completed the initial survey questionnaires but did not start the course for reasons unknown. A further 140 individuals did not complete the post-test measures and were removed from the final analysis along with the non-starters, leaving 314 participants (96.2% females, 3.8% males) to be included in further analyses. Twenty-six participants with a BMI in the normal range (below 25) as well as participants who did not provide weight or height measurements were included in data analyses. A total of 237 participants completed 6-month follow-up questionnaires. Of these, 21 participants had missing data and were removed from further analyses, leaving 216 participants for 6-month follow-up analyses (68.7% of individuals from the EFT condition). A total of 152 individuals completed 12-month follow-up questionnaires. Of these, seven had missing data and were removed from further analyses, leaving 145 (46.17%) participants for 12-month follow-up analyses.

Of the waitlist control group, a total of 254 individuals completed the pre-wait survey, of which 26 participants had missing data and were excluded from further analyses, leaving 228 participants for the second survey (post-eight-week wait) analyses. One hundred and sixty-four individuals in the waitlist control group completed the second survey (post-waitlist measures), of which 26 had missing data and were excluded from further analyses, leaving 137 participants (94.1% females, 5.9% males) for between-group analyses. A total of 95 participants completed post-intervention questionnaires in the waitlist control group following completion of the EFT intervention. Of these, 25 participants had missing data, leaving 70 participants.



**Figure 2** CONSORT flow of participants in trial.

## 2.2 Measures

**Anthropometric Measures.** Self-reported weight and weight measurements were obtained to calculate BMI, which was defined as weight in kilograms divided by the square of the height in metres (kg/m<sup>2</sup>). BMI categories utilised for the present study included: underweight (< 18.5), healthy weight (18.5 – 24.9), overweight (25.0 – 29.9), obese class I (30.0 – 34.9), obese class II (35 to 39.9), and obese class III (> 40). Self-reported weight and height provides relatively accurate estimates of BMI in community samples [61,62].

Food Craving Inventory (FCI) [63]. The 37-item self-report FCI was used to assess specific food-type cravings in the past month. The FCI consists of four subscales: fats (e.g., butter, sausage, sweets, carbohydrates, and fast foods). Participants rated how often they have experienced a craving on a 5-point Likert scale ranging from 1 (Never) to 5 (Always/Almost Every Day). The FCI total score was used to assess changes in food craving symptomatology, with higher scores reflecting greater craving. The FCI demonstrates high internal consistency ( $\alpha = .93$ ) and test-retest reliability ( $r = .91$ ) [63]. In the current study, reliability coefficients for the subscales in the current analysis ranged from adequate ( $\alpha = .65$ ) to good ( $\alpha = .79$ ).

The Power of Food Scale (PFS) [64]. The 21-item self-report PFS was used to assess the psychological impact of environments in which highly appetising foods are readily available. Participants rate the extent to which statements describe them on a 5-point Likert scale from 1 (I Don't Agree at All) to 5 (Strongly Agree). Higher scores indicated higher responsiveness to the food environment. The PFS has good convergent validity with the TFEQ's [65] disinhibition subscale ( $r = .61$ ), and the DEBQ's [66] external eating subscale ( $r = .66$ ) [64]. In the current analysis, the PFS demonstrated excellent internal consistency ( $\alpha = .95$ ).

The Revised Restraint Scale (RRS) [67]. The 10-item self-report RRS provided an assessment of the behaviours associated with chronic dieting. The RRS comprises two subscales: six-item Concern for Dieting (CD) scored on 5-point Likert scale, ranging from 1 (Never) to 5 (Always), and four-item Weight Fluctuations (WF) scored from 1 (0–4 lb / 0–1.82 kg) to 5 (20+ lb/9.09+ kg). Higher scores indicated chronic dieting without substantial weight-loss. Cut-off scores ( $\geq 16$ ) were used to identify restrained eaters in the current study. The RRS has established criterion validity, differentiating individuals with bulimia nervosa from dieters (non-eating disordered) and non-dieting controls [68]. The RRS demonstrated acceptable internal consistency for the total scale ( $\alpha = .65$ ) in the current sample.

Patient Health Questionnaire (PHQ) [69]. The PHQ was used to assess symptoms of depression, anxiety, and somatoform. Participants rated their experience of nine depressive items (PHQ-D subscale) from the preceding two-week period on a 4-point Likert scale (0 = Not At All to 3 = Nearly Every Day), seven anxiety symptoms on a 3-point Likert scale from 0 (Not At All) to 2 (More Than Half The Days), and 15 physiological complaint items (e.g., headaches) on a 3-point Likert scale, ranging from 0 (Not Bothered) to 2 (Bothered A Lot). Respective cut-off scores for each subscale were used to assess the severity of symptomology. Each subscale has high internal consistency ( $\alpha > .85$ ) and the PHQ scale has excellent test-retest reliability ( $r > .80$ ) [70,71].

### 2.2.1 Treatment Conditions

The EFT online treatment was a self-paced eight-week program accessed via a supplied Internet link. Weekly reminder emails were sent to participants to highlight the theme of the corresponding weekly module. Participants could post questions for the first author in a private Facebook group (e.g., they could receive feedback or guidance on their statements particularly if they needed assistance with effective statements). While this interaction was optional, 78% of participants engaged in the Facebook group. The waitlist control group EFT intervention mirrored the EFT treatment group process, including the provision of an online support group for the eight weeks. Both Facebook groups were disbanded at the end of the trial.

The online EFT treatment consisted of seven modules, comprising 32 pre-recorded video sessions, that were presented by a clinical psychologist who was a certified EFT practitioner. Each module was accessed via an online link, consisting of three to eight lessons, ranging from two to 15 minutes in duration. Participants were instructed to view one session per day and not exceed more than one module per week to maintain motivation and avoid burnout. Participants could repeat and review the recorded sessions; however, completion of a session quiz before progressing to the next video was required. Module topics are presented in Table 2 and examples of how EFT was used for each topic are provided.

The first video in each module consisted of an introduction to the corresponding weekly topic. Treatment sessions involved exposure to the craved food (which the participants supplied during session six). Participants were instructed to focus attention on their craving(s) and associated emotions while applying the tapping method as per the EFT manual [72]. For example, EFT intervention involved the following protocols: identification of a trigger (e.g., thought, feeling, sensation, memory, behaviour) and a rating of their current distress related to the trigger on a 0 to 10-point scale (SUDS) [23]. The rating provides a current self-assessment of the subjective intensity of distress experienced by an individual. The next step involves setting up the tapping by speaking a two-part set-up statement. The first part of the set-up acknowledges the identified issue, which allows for dealing with it more effectively. The second part involves repeating a self-acceptance statement or affirmation three times while tapping with the fingertips of the index finger and middle finger of the other hand on the karate chop point, which is the centre of the outside of the hand between the top of the wrist and the base of the little finger. An example tapping statement from Module 2 was: “Even though this food smells so delicious, I deeply and completely accept myself”. Participants were encouraged to use EFT throughout the trial during times of craving if required.

Waitlist control group. All waitlist participants (n = 228) began the EFT treatment which was identical to the EFT treatment group eight weeks from the pre-test. The waitlist group post-test data (n = 70) was compared against the active treatment group (n = 314).

**Table 2** Summary of treatment sessions.

Session	Topic	Example of EFT Statements
(1) Introduction to EFT	Described EFT treatment participants were to receive, and gave examples of how it would be applied	
(2) Tapping on less healthy foods	Discussed the nature of food cravings including being an emotionally and physiological intense urge (to eat). Discussed how cravings have been shown to elicit binge-eating episodes – demonstrations of how EFT is used to reduce food cravings	<p>Examples of Set up Statements - Even though I love sugary foods...., I completely accept myself. Or, even though I crave something sweet (or whatever it is after meals), I completely accept myself.</p> <p>Reminder/Shortened phrase - This craving, my craving; Love sugar; I crave this food; I love this food, desperate to eat this yummy</p>
(3) Tapping on healthier foods	Discussed how EFT is used to increase the desire for healthier food choices	<p>Examples of Set up Statements- Even though I hate salad, it is so boring, I accept I feel this way; Even though I hate vegetables, and want something else, I accept I feel this way; Even though it is so boring to eat healthy foods, I accept myself anyway</p> <p>Reminder/Shortened phrase - so boring; hate taste of fruit; hate vegetable taste; salad tastes boring</p>

(4) Tapping on emotional eating	Discussed the primary emotions (i.e., Anger, Sadness, Surprise, Fear, Distress, Disgust, Guilt, Shame, and Interest), and their relationship to emotional eating and cravings. Discussed how EFT is used for these	<p>Examples of Set up Statements - Even though I can't stop feeling anxious/ can't control my anxiety I completely love and accept myself; Even though I am afraid and I won't know what to say and will make a fool of myself, I choose to accept myself anyway; Even though I'm surprised that I will lose control at.....I completely love and accept myself anyway; Even though I know I tend to eat to relieve my feelings of anxiety or stress, I deeply and completely accept myself.</p> <p>Reminder/Shortened phrase - Feeling anxious; Can't stop being anxious; Can't control my anxiety; I'm afraid I might make a fool of myself; I might lose control; I'm afraid; This fear; This anxiety; Eat to relieve anxiety; Eat to relieve stress; Stressed.</p>
(5) Tapping on increasing the desire for physical activity	Discussed how EFT is used to assist with motivation for exercise	<p>Examples of Set up Statements- Even though I loathe exercising, I deeply love and accept myself; Even though I feel fatigued and too tired to exercise, I choose to know that my energy levels will improve as I get fitter and I choose to be fit and healthy anyway; Even though exercise feels like punishment, I choose to know that it will help me and I completely love and accept myself anyway;</p> <p>Reminder/Shortened phrase - Loathe</p>

		exercise; Hate exercise; Feel too tired; Feel fatigued; Choose to be fitter; Choose to know I'll improve; It's too hard; Feels like punishment; No motivation
(6) Tapping on drinks	Discussed how EFT is used to increase the desire for healthier drink choices, and how to reduce the desire for unhealthy choices	Examples of Set up Statements- Even though I dislike the taste of water, I deeply and completely accept myself; Even though I don't like drinks that have no smell I deeply and completely accept myself; Even though I'd prefer to drink (say the name of what you'd prefer to drink) than drink water I deeply and completely accept myself Also – Even though I love the taste of sugary drinks, I love the smell and the feel in my mouth, I accept I feel this way Reminder/Shortened phrase - (for water) Dislike the taste; Smells horrible; Hate the feeling in my stomach; I'd rather drink something else; (for other drinks) – I love the taste; I love the smell; it's so sugary
(7) Tapping into mindful-intuitive eating.	Discussed stress (distress versus eustress), and how these concepts impact emotional eating and cravings. Discussed the concept of mindful-intuitive eating	

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Of the 314 EFT treatment group participants who completed pre- and post-test surveys, 237 participants completed 6-month post-test questionnaires. Missing data ( $n = 21$ ) were removed leaving 216 EFT treatment participants (68.7%). A total of 152 participants completed the 12-month follow-up questionnaires. Missing data ( $n = 7$ ) were removed, leaving 145 (46.17%) participants for 12-month follow-up analyses. Of the 137 participants in the waitlist control group who completed post-waitlist measures, 95 participants completed post-test questionnaires following completion of the EFT intervention. Missing data ( $n = 25$ ) were removed leaving 70 participants to be collapsed into the EFT group for repeated measures analyses ( $n = 384$ ). Chi-square analysis revealed no significant group differences between weight, eating behaviour inventories, and psychological symptomology at pre-intervention (see Table 3).

### 3. Results

#### 3.1 Analyses

Initial data screening measures were taken to control for and to ensure the distribution fit with the assumptions of a two-way mixed ANOVA. The data file was also visually inspected for keystroke errors. Inspection of boxplots revealed several outliers, however since these scores are likely reflecting genuinely unusual values, they were included in the final analyses.

Descriptive statistics were used to quantitatively describe the distribution of study variables. A series of chi-square analyses were conducted to examine any differences between the two conditions (i.e., EFT treatment and waitlist control group) before intervention based on demographic variables and scores from outcome measures.

Eight separate 2 x 2 mixed-method (between-within subject) ANOVAs were conducted to determine the effect of EFT and the waitlist control condition on the dependent variables (i.e., FCI, PFS, RRS, PHQ-S, PHQ-D, PHQ-A, weight, and BMI) over time (pre-intervention vs. immediately post-intervention). The waitlist control group received the EFT intervention following the waitlist period. In this crossover study design, eight 2 x 4 repeated measures (within-subjects; **Time as the within factor and Group as the between factor**) ANOVAs were performed using all intervention data because there were no differences at baseline between the two groups, to determine the effect of EFT on the dependent variables over time (pre-intervention vs. immediately post-intervention vs. 6-month follow-up vs. 12-month follow-up). In the current study, only participants who completed both pre- and post-test measures were included in final analyses.

Seven separate two-way mixed-method repeated measures ANOVAs were conducted to determine whether there were statistically significant differences ( $p < .05$ ) between the treatment condition and the waitlist controls following the eight-week EFT.

##### 3.1.1 Food Craving Inventory

There was a statistically significant interaction between the intervention and time on degree of food cravings,  $F(1, 450) = 80.807$ ,  $p < .001$ , partial  $\eta^2 = .152$ . There was a statistically significant difference in food cravings between interventions at post measure,  $F(1, 449) = 58.819$ ,  $p < .001$ , partial  $\eta^2 = .116$ . Degree of food cravings was significantly lower in the EFT group than in the waitlist group at post-intervention measure, which indicates that the participants in the EFT group

experienced fewer food cravings for highly palatable food than the participants in the waitlist group following the eight-week intervention period.

### 3.1.2 Power of Food Scale

There was a statistically significant interaction between the intervention and time on perceived power of food,  $F(1, 450) = 80.333$ ,  $p < .001$ , partial  $\eta^2 = .151$ . There was a statistically significant difference in perceived power of food between interventions at post measure,  $F(1, 449) = 59.655$ ,  $p < .001$ , partial  $\eta^2 = .117$ . Perceived power of food was significantly lower in the EFT group than in the waitlist group at post-intervention measure, which indicates participants in the EFT group felt less controlled by the palatable food in their environment than the participants in the waitlist group following the eight-week intervention period.

### 3.1.3 Revised Restraint Scale

There was a statistically significant interaction between the intervention and time on restraint capabilities,  $F(1, 445) = 29.946$ ,  $p < .001$ , partial  $\eta^2 = .063$ . There was a statistically significant difference in restraint capabilities between interventions at post-intervention measurement,  $F(1, 446) = 31.928$ ,  $p < .001$ , partial  $\eta^2 = .067$ . Restraint capabilities were significantly lower in the EFT group compared to the waitlist group at post-intervention, which indicates participants in the EFT group experienced less dietary restraints and exhibited less restrained eating patterns than participants in the waitlist group following the eight-week intervention period.

### 3.1.4 Somatic Symptomatology

There was a statistically significant interaction between the intervention and time on somatic symptomatology,  $F(1, 447) = 18.141$ ,  $p < .001$ , partial  $\eta^2 = .039$ . There was a statistically significant difference in somatic symptomatology between interventions at post measure,  $F(1, 447) = 29.836$ ,  $p < .001$ , partial  $\eta^2 = .044$ . Somatic symptomatology was significantly lower in the EFT group than in the waitlist group at post-intervention measure, which indicates participants in the waitlist condition were more bothered by somatic or physical symptoms, such as aches and pains, than participants in the EFT condition following the eight-week intervention period.

### 3.1.5 Depressive Symptomatology

There was a statistically significant interaction between the intervention and time on depressive symptom scores,  $F(1, 447) = 29.836$ ,  $p < .001$ , partial  $\eta^2 = .063$ . There was a statistically significant difference in depressive symptoms between interventions at post measure,  $F(1, 448) = 31.980$ ,  $p < .001$ , partial  $\eta^2 = .067$ . Depressive symptoms were significantly lower in the EFT group than in the waitlist group at post-intervention measure, which indicates participants in the waitlist condition were experiencing more depressive symptomatology than participants in the EFT condition following the eight-week intervention period.

### 3.1.6 Anxious Symptomatology

There was a statistically significant interaction between the intervention and time on anxiety symptom scores,  $F(1, 224) = 4.652$ ,  $p = .032$ , partial  $\eta^2 = .020$ . There was a statistically significant difference in anxiety symptoms between interventions at post measure,  $F(1, 274) = 6.361$ ,  $p = .012$ , partial  $\eta^2 = .023$ . Anxiety symptoms were significantly lower in the EFT group than in the waitlist group at post-intervention measure, which indicates participants in the waitlist condition were experiencing more anxious symptomatology than participants in the EFT condition following the eight-week intervention period.

### 3.1.7 BMI

There was a statistically significant interaction between the intervention and time on BMI,  $F(1, 432) = 8.345$ ,  $p = .004$ , partial  $\eta^2 = .019$ . There was a statistically significant difference in BMI between interventions at post-intervention measurement,  $F(1, 436) = 9.471$ ,  $p = .002$ , partial  $\eta^2 = .021$ . BMI was significantly lower in the EFT group compared to the waitlist group at post-intervention, which indicates participants in the EFT group lost more weight than participants in the waitlist group following the eight-week intervention period.

**Table 3** Means and standard deviations for the intervention group compared to the waitlist control group, including univariate between-subjects analyses.

Variable	EFT Group		Waitlist Group		Between-group effects	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
FCI (Baseline)	82.86	19.40	81.59	18.40	.768	.381
FCI (Post)	67.25	17.05	81.31	18.93	58.82	< .001
PFS (Baseline)	72.29	18.63	72.60	18.88	.013	.908
PFS (Post)	57.22	19.59	72.48	17.94	59.65	< .001
RRS (Baseline)	33.47	5.13	34.31	5.14	2.50	.114
RRS (Post)	31.36	5.30	34.38	5.1	31.92	< .001
PHQ-S (Baseline)	20.95	4.36	21.26	4.68	.936	.334
PHQ-S (Post)	19.03	3.52	20.89	4.50	29.84	< .001
PHQ-D (Baseline)	18.98	5.76	19.82	6.23	1.58	.210
PHQ-D (Post)	15.52	5.31	18.78	5.98	31.98	< .001
PHQ-A (Baseline)	14.15	3.32	14.03	3.50	.078	.780
PHQ-A (Post)	13.08	3.27	14.06	3.26	6.36	.012
Weight (Baseline)	89.86	18.48	94.84	20.30	6.92	.014
Weight (Post)	88.81	18.58	94.80	20.43	9.65	.002

Note. FCI = Food Craving Inventory. PFS = Power of Food Scale. RRS = Revised Restraint Scale. PHQ-S, D, A = Patient Health Questionnaire – Somatic, Depressive, and Anxious symptoms. BMI = Body Mass Index.

### 3.2 Pooled Data

Data was pooled for both treatment groups across 6-month and 12-months post-test measures ( $n = 384$ ). This was in line with statistical approaches previously employed for repeated measures analyses [44], and this pooling strategy has been used in previous studies [74-76]. Seven one-way repeated-measures ANOVAs were conducted to detect whether there were significant differences for all participants ( $n = 384$ ) on the outcome variables immediately post-intervention and at the 6-month and 12-month follow-ups. The omnibus tests revealed a significant within-subject difference across time points for all outcome variables at a  $p$  value  $< .001$ . Associated means at each of the time points are presented in Table 4. Post hoc pairwise comparisons were conducted with a Bonferroni adjustment to assess the differences across time points. Associated significance values and mean difference scores between time points are detailed in Table 5.

**Table 4** Collapsed group mean scores and standard deviations for the dependent variables across time.

Variable	Collapsed EFT and Waitlist Group Means		95% CI	
	<i>M</i>	<i>SD</i>	<i>Lower</i>	<i>Upper</i>
FCI (Baseline)	81.00	18.75	77.70	84.31
FCI (Post)	62.48	14.91	59.85	65.11
FCI (6-mth follow-up)	62.46	15.73	59.69	65.23
FCI (12-mth follow-up)	62.04	17.06	59.04	65.05
PFS (Baseline)	71.49	18.04	68.30	74.66
PFS (Post)	54.80	18.52	51.53	58.07
PFS (6-mth follow-up)	51.52	19.63	48.06	54.99
PFS (12-mth follow-up)	52.27	20.22	48.70	55.84
RRS (Baseline)	32.93	4.77	32.10	33.77
RRS (Post)	30.61	5.05	29.72	31.50
RRS (6-mth follow-up)	29.63	5.51	28.66	30.60
RRS (12-mth follow-up)	29.26	5.74	28.25	30.27
PHQ-S (Baseline)	20.33	4.60	19.51	21.14
PHQ-S (Post)	18.52	3.33	17.93	19.11
PHQ-S (6-mth follow-up)	18.11	3.57	17.48	18.74
PHQ-S (12-mth follow-up)	18.02	3.40	17.42	18.62
PHQ-D (Baseline)	16.63	5.00	15.75	17.51

PHQ-D (Post)	14.05	4.22	13.30	14.80
PHQ-D (6-mth follow-up)	14.29	4.80	13.44	15.14
PHQ-D (12-mth follow-up)	14.65	4.88	13.79	15.52
PHQ-A (Baseline)	14.39	2.66	13.45	15.34
PHQ-A (Post)	12.54	2.69	11.59	13.50
PHQ-A (6-mth follow-up)	12.45	2.51	11.56	13.34
PHQ-A (12-mth follow-up)	11.00	2.43	10.13	11.86
Weight (Baseline)	85.81	16.95	82.73	88.90
Weight (Post)	84.75	17.25	81.62	87.89
Weight (6-mth follow-up)	84.25	16.49	81.26	87.25
Weight (12-mth follow-up)	83.42	15.82	80.56	86.30

Note. FCI = Food Craving Inventory. PFS = Power of Food Scale. RRS = Revised Restraint Scale. 95% CI = 95% confidence intervals for the total mean scores (i.e., collapsed across EFT and waitlist).

Patient Health Questionnaire symptomology. Somatic symptom severity decreased significantly ( $p < .001$ ) from pre-intervention to immediately post-treatment, six months, and 12-months post-intervention. There were no significant differences in participants' somatic symptom severity from post-intervention to six or 12-months, respectively, nor between six and 12-months, indicating that somatic scores decreased and remained stable over time. Results suggest a similar pattern for depressive scores, with pre-intervention scores significantly different from immediately, six months, and 12-months post-intervention, and no significant differences between other time points; depressive symptomology reduced and remained consistent over time. Participants' anxiety significantly decreased from pre-intervention to immediately ( $p = .043$ ), six months ( $p = .010$ ), and 12 months post-intervention ( $p < .001$ ). Participants' anxiety scores also reduced from post-intervention to 12 months ( $p = .026$ ) and six months post-intervention to 12 months ( $p = .043$ ).

Eating behaviour inventories. Food craving scores on the FCI significantly decreased ( $p < .001$ ) from pre-intervention to immediately following treatment, six months, and 12 months ( $p < .001$ ) post-intervention. No significant differences were found between other time points, suggesting participants' reduced food cravings stayed intact following the EFT intervention. Significant reductions for participants' POFS scores were distributed the same as food cravings, with significant decreases from pre-intervention to the three post-test time points ( $p < .001$ ) and non-significant differences for all the others. Therefore, participants' subjective feelings of being controlled by food in their environment were reduced and remained following the EFT intervention. Dietary restraint capabilities, as measured by the RRS, decreased significantly from pre-intervention to the other three time points ( $p < .001$ ) and were also significantly reduced from post-intervention to six ( $p = .036$ ) and 12-months ( $p = .002$ ) following the intervention.

Weight. Participants' weight was found to significantly decrease from pre-intervention to immediately ( $p = .006$ ), 6-months ( $p = .013$ ), and 12-months post ( $p = .003$ ). Results suggest that participant weight was reduced immediately following intervention and remained relatively stable over time. Participants reduced their weight by an average of 2.39 kilograms (5.26 pounds), representing a 3.0% reduction from baseline measures.

**Table 5** Collapsed group mean differences and standard deviations for all measures across time, including 95% confidence.

<i>Variable + Time Point</i>	<i>MD</i>	<i>p</i>	<i>Cohen's d</i>
Somatization		< .001*	
1 → 2	2.08	< .001*	.52
1 → 3	2.22	< .001*	.56
1 → 4	2.31	< .001*	.59
2 → 3	0.41	.879	-
2 → 4	0.50	.394	-
3 → 4	0.09	1.000	-
Depression		< .001*	
1 → 2	2.58	< .001*	.70
1 → 3	2.34	< .001*	.51
1 → 4	1.98	< .001*	.43
2 → 3	-0.24	1.000	-
2 → 4	-0.60	.757	-
3 → 4	-0.36	1.000	-
Anxiety		< .001*	
1 → 2	1.85	.043*	.74
1 → 3	1.94	.010*	.77
1 → 4	3.39	< .001*	1.21
2 → 3	0.09	1.000	-
2 → 4	1.54	.026*	.63
3 → 4	1.45	.043*	.56
Food Cravings		< .001*	
1 → 2	18.52	< .001*	1.13
1 → 3	18.54	< .001*	1.08
1 → 4	18.96	< .001*	1.07

2 → 3	0.02	1.000	-
2 → 4	0.44	1.000	-
3 → 4	0.42	1.000	-
Power of Food		< .001*	
1 → 2	16.69	< .001*	.99
1 → 3	19.97	< .001*	1.13
1 → 4	19.22	< .001*	1.10
2 → 3	3.28	.165	-
2 → 4	2.53	.525	-
3 → 4	-0.75	1.000	-
Restraint		< .001*	
1 → 2	2.32	< .001*	.60
1 → 3	3.30	< .001*	.74
1 → 4	3.67	< .001*	.79
2 → 3	0.98	.036*	.25
2 → 4	1.35	.002*	.32
3 → 4	0.37	1.000	-
Weight (kg)		< .001*	
1 → 2	1.06	.006*	.31
1 → 3	1.56	.013*	.33
1 → 4	2.39	.003*	.36
2 → 3	0.50	1.000	-
2 → 4	1.33	.209	-
3 → 4	0.83	.523	-

Note. 1 = pre-intervention, 2 = post-intervention, 3 = six-mth follow-up, 4 = 12-mth follow-up.  
*p* = significance value \* statistically significant, MD = mean difference.

#### 4. Discussion

The current study sought to assess the impact of an eight-week online EFT treatment program on psychological symptomology, food cravings, and weight management in overweight and obese individuals using a waitlist control group for comparison. The study also aimed to assess the effectiveness of EFT for treating depressive, anxious, and somatic symptomatology (using both the EFT active treatment and waitlist control group collapsed after they received the EFT intervention leaving no between-group differences at 6- and 12-month follow-up).

Following the EFT eight-week program, participants' weight, post-test measures of psychopathology symptomology, and eating behaviours associated with food overconsumption

had significantly reduced. Furthermore, these reductions were maintained at the 6-month and 12-month follow-ups. Current results support previous research that has suggested EFT as an effective intervention strategy for the treatment of weight and eating issues in overweight/obese adults. Moreover, current findings point to the efficacy of online EFT treatment delivery.

#### **4.1 Group Comparisons**

Results indicated EFT delivered in an online format significantly reduced food cravings, dietary restraint, and power of food in participants in the EFT group. No statistically significant differences in these variables from pre- to immediately post-intervention for participants in the waitlist control group were found. The current finding is consistent with previous research on the effect of in-person EFT intervention on food-related issues [43,44,73] in which overall reductions in food cravings were found at post-intervention and maintained in the ensuing year. Additionally, these findings demonstrate the efficacy of online delivery of EFT for food cravings, which suggests that well-structured online programs following clinical guidelines, may be associated with similar positive effects as attending in-person therapy.

Participants also experienced significant decreases in the severity of somatic, anxiety, and depression symptoms immediately following the EFT program compared to the waitlist control group, who displayed no significant differences in psychological symptoms. This current finding is consistent with previous research on the efficacy of EFT for reducing a variety of psychological and physiological symptoms such as anxiety [37, 38], depression [73], pain [36,37], and headaches [30].

Participants in the EFT group exhibited significant decreases in weight immediately following the treatment program compared to the initial non-significant differences after eight-weeks for the waitlist control group. Whereas other studies reported no significant reductions in weight at immediately post-intervention [44, 73], the results from the current study suggested the efficacy of online EFT in assisting immediate weight reduction. The effect sizes, however, were small for weight at post-intervention ( $d = .019$ ), which is likely a result of the short eight-week time frame between measurements. While the EFT treatment group achieved an average weight reduction of one kilogram between pre- and immediate post-test measures without dietary or physical exercise guidance, improvements in restrained eating patterns following the EFT intervention and the adoption of more adaptive eating habits by participants may have influenced this result. In addition to the reduction of caloric intake, it is possible that increased levels of physical activity may have resulted in greater weight loss across the trial. Module five of the eight-week EFT program addresses the use of EFT to increase motivation to exercise. However, in the current study activity levels were not assessed and this is a limitation. Measures of physical activity levels, in addition to caloric intake, would help inform understanding the aspects of weight loss management that may be enhanced through EFT treatment. In sum, online provision of EFT was found to have clinical utility in food cravings, psychological symptomology, and weight loss in overweight and obese individuals compared to a waitlist control group.

#### **4.2 Efficacy Over Time**

Results supported the hypothesis that treatment gains observed on outcome variables immediately post EFT intervention would be maintained at the six and 12-month follow-up time points. Twelve-month follow-up measures indicated significant improvements in psychological



distress symptoms (i.e., anxiety and depression), as well as over-eating behaviour symptoms, such as preoccupation with food and overconsumption of unhealthy foods, following the eight-week EFT intervention. Food cravings, power of food, and weight measures did not indicate further improvements from immediately post-intervention to the two follow-up time points. It is possible participants in the current study did not experience food cravings for previously desired foods following their treatment. Accordingly, participants no longer needed to engage in tapping to reduce the cravings, which would help explain the non-significant results overtime. While participants were advised to continue using EFT if needed, a survey indicated only 20% of the total sample did continue to use the technique. Although the eight-week duration of the EFT intervention in the current study was in line with prior trials (e.g., [44]), future research designs could assess whether a longer program duration would produce similar effects.

The sustained improvements in measured outcomes following EFT treatment are consistent with previous research on the long-term effect of EFT on food cravings and weight management [20,44] and psychological conditions, such as depression, PTSD, and anxiety [37, 55, 73]. Notwithstanding the smaller reductions in weight post-12-month compared with prior research [43, 73], current 12-month measures still indicated that EFT was able to result in significant changes without continued therapeutic application. Overall, present results support the notion that the changes that occurred within the eight-week program were sufficient to influence and maintain weight reduction.

In terms of dietary restraint, results suggested that EFT continued to influence restraint capabilities at the six and 12-month follow-up. The literature suggests that individuals who adopt more adaptive coping strategies no longer engage in repeated cycles of dieting and overeating [78]. Increases in restraint are also consistent with the observed reductions in food cravings and reductions in the impact of living in a food-abundant environment. Future studies could look to assess coping styles, in addition to measures of restrained eating and weight loss management, which may help provide additional clinical insight into the impact of EFT intervention.

In terms of weight loss maintenance, 78% of participants joined the Facebook support group that was made available for the duration of the trial. As noted previously by Groesbeck et al. [32] in evaluating a brief group-based intervention, the effects observed in the current study may be attributed to non-specific variables such as the supportive nature of the Facebook group or the sympathetic attention provided by the group members. Therefore, the provision of an online community communication vehicle should inform future experimental design.

#### **4.3 Limitations and Implications for Further Research**

The present study had several limitations that could be addressed in future research. Although the active treatment condition was compared to a waitlist control group, there was no active intervention comparison group. EFT intervention has been compared to CBT for food cravings delivered in-person at a group scale, which revealed comparable findings for EFT and CBT in the reduction of food cravings, power of food, and dietary restraint [44]. Future studies could compare the efficacy of online delivery of EFT for food cravings with a gold-standard therapeutic intervention (e.g., online delivery of CBT) and in-person EFT treatment designs. Such designs should also attempt to control for participant expectancy effects and other non-specific effects of any treatment [31,79].

There was some attrition in the study during follow-up periods although multiple attempts were made to contact participants. While intention to treat analysis was considered, the end-point data often differs markedly among noncompliant, dropouts, and compliant subjects. This can then make interpretation difficult if a large proportion of participants cross over to opposite treatment arms. Thus the data was analysed as it was, but future studies need to consider retention and follow-up when delivering online trials and consider offering incentives.

Significantly more women than males participated in the study, represented by a ratio of 9:1. Consequently, present results of the effects of online EFT intervention on food cravings cannot be generalized to the adult male population. Although the gender disparity in the current sample aligns with prior research that has found women more likely to experience food cravings than obese males [80,81], and develop mood and anxiety disorders throughout the lifespan [82,83], a more gender-balanced sample should be sought for future research. Finally, in the current study, the age of participants (women) was predominantly between 41 to 60 years. This has also occurred in other EFT trials (e.g., [44,84]) and might be a function of the self-selection process and the novelty of EFT as a technique particularly when prior weight-loss efforts have been unsuccessful. Therefore, future studies may look to examine the impact of EFT on younger adult samples. Finally, the study lacked an objective BMI assessment as only subjective weight/BMI was reported, and future research may also benefit from measuring binge eating behaviour and consumption of craved foods, in order to investigate the mechanisms of EFT on these aspects.

Notwithstanding the limitations, the current study has provided preliminary evidence for the utility of online EFT as an adjunct tool to help address the worldwide obesity epidemic. It is suggested that future research validate the efficacy of EFT in the treatment of food cravings and weight management by conducting replication studies as well as longitudinal follow-up studies. Future research is also urged to investigate how an online EFT program can be made accessible to people worldwide and how EFT can be included in the existing treatment and management of weight gain and obesity.

## **5. Conclusions**

The current study represented the first RCT designed to assess the effectiveness of online delivery of EFT intervention on psychological symptomatology, food cravings, and weight-loss management. Results have made a substantial contribution to the current state of knowledge of EFT intervention, providing preliminary support for the suitability of EFT for the management of food cravings, and associated weight-loss, when delivered in an online format. The existing research indicating that stimulating selected acupoints sends deactivating signals to the amygdala, which then results in decreased activity, including in brain areas associated with fear and anxiety appear to also be a mechanism in the reduction of cravings. The stimulation of acupoints in the current study simultaneously decreased anxious and emotional responses, and in addition intensity of cravings. Follow-up data indicated that the effects were maintained for 12-months, which suggests long-term treatment effects as well as the possibility of considerable lifestyle change. As obesity has high comorbidity with a range of psychological issues including stress, anxiety, and depression, it is crucial that ongoing attention is provided to strategies that increase the likelihood of successful long-term weight loss, and delivery in an online format may be beneficial.

## **Acknowledgments**

None

## **Author Contributions**

Peta Stapleton conceived and designed the experiment, provided videos for the trial online delivery, was available in the online group for participant support, oversaw data collection and analysis and staff supervision, and manuscript drafting and completion.

Trude Roos assisted with survey follow-up after the trial, acquired and analysed data, and drafted the original manuscript.

Glenn Mackintosh assisted with experiment design and online delivery and was available in the online group for participant support.

Emma Sparenburg assisted with online delivery of the trial including design and layout and all follow-up of survey data.

Brett Carter assisted with drafting the original manuscript and data analysis.

Debbie Sabot assisted with the final manuscript completion and editing.

## **Funding**

None

## **Competing Interests**

The first and third authors may derive income from keynote speeches and trainings related to the topic explored, because of their relevant expertise. There are no other conflicts that exist.

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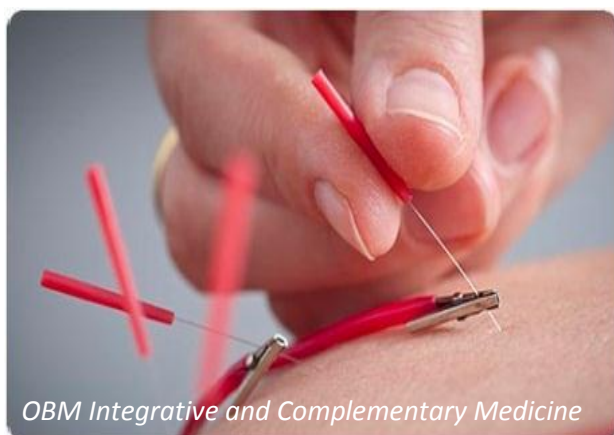
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